Coupled Subcritical Water and Solid Phase Extraction for In-Situ Chemical Analysis, Phase I

Completed Technology Project (2014 - 2014)

Project Introduction

Leiden Measurement Technology (LMT) will design and develop a low volume analyte separation, concentration, and transfer system (ConTech), that couples a Subcritical Water (SCW) Extractor with Solid Phase Extraction (SPE) technology to extract analytes from complex host matrixes (e.g., soil, regolith, ice) and transfers them to a broad range of analytical instruments in situ. The use of SCW eliminates the need for organic solvents while allowing polarity-based separation of trace levels (ppb or below) of a broad range of inorganic and organic species. The technology will be developed to minimize mass, volume and power-usage and for compatibility with state-of-art in situ instruments currently under development by NASA including: microfluidic based systems, bioarrays, gas chromatography, high performance liquid chromatography, UV fluorescence spectroscopy, Raman spectroscopy, and mass spectroscopy. The specific objectives of the Phase I R&D effort are: 1) Assemble a compact prototype SCW-SPE system capable of extracting, separating, trapping, concentrating, and transferring/delivering soluble inorganic ions, polar organics, and non-polar organics. 2) Determine the system requirements (solid phase extraction materials, volume, geometry, temperature, flow) needed for processing Mars relevant organics in complex matrices. 3)Optimize analyte recoveries and perform an end-to-end proof-of-concept with laboratory prototype. 4)Determine power, mass and volume requirements needed to meet analytical requirements. 5) Develop a design for a Phase II system.

Primary U.S. Work Locations and Key Partners

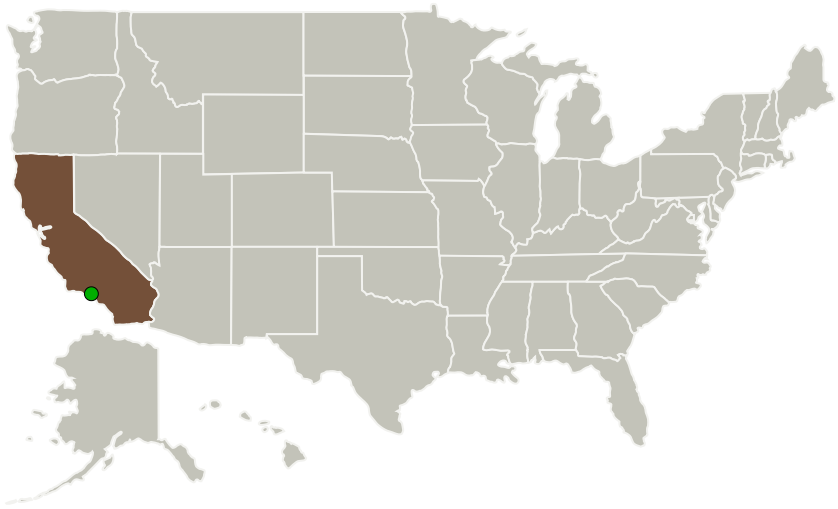

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Table of Contents

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Organizations Performing Work	Role	Type	Location
Leiden Measurement Technology, LLC	Lead Organization	Industry	Sunnyvale, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

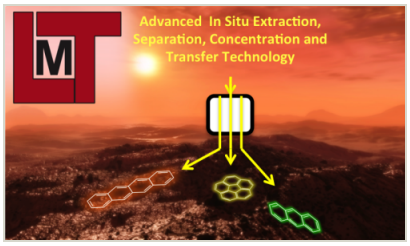
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137708)*

Images



Briefing Chart
Coupled Subcritical Water and Solid Phase Extraction for In-Situ Chemical Analysis, Phase I *(https://techport.nasa.gov/image/137046)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Leiden Measurement Technology, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

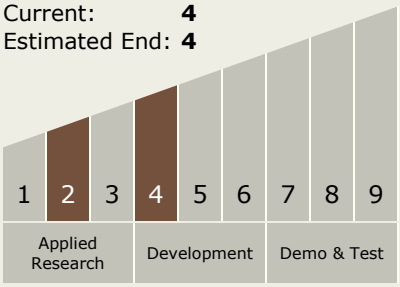
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Richard C Quinn

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System